Dimensionless Quantities

$$\rho = \frac{r_p}{a} \quad , \quad r = \frac{2a}{\lambda R} r_i = \frac{r_i}{\lambda F} \quad , \quad F = \frac{R}{2a} = \frac{R}{D}$$

• r_i is the radial distance of a point in the image plane, and r is dimensionless representing the distance in units of λF.

$PSF(\vec{r}_i)$ is in units of m^{-2} and $I_i(\vec{r}_i) = P_{ex} PSF(\vec{r}_i)$

$$I(\vec{r}) = \frac{I_i(\vec{r}_i)}{I_i(0)}$$ is dimensionless

• $I_i(\vec{r}_i)$ is the irradiance at a point $\vec{r}_i$ in units of W/m^2, and $I(\vec{r})$ is the irradiance normalized by the central value $I_i(0)$.

$P_i(r_c)$ is in units of W and represents the image power in a circle of radius r_c.

$$P(r_c) = \frac{P_i(r_c)}{P_{ex}}$$ is dimensionless (and represents the encircled power normalized by the total power P_{ex} in the pupil or the image)

$\tau(\vec{v}_i)$ is dimensionless (and represents the fractional area of overlap of two pupils separated by $\lambda R\vec{v}_i$ in the aberration-free case).

v_i has dimensions of m^{-1} as in lines/mm

$v = \dfrac{v_i}{1/\lambda F}$ is dimensionless (and represents the image spatial frequency normalized by the cutoff frequency $v_c = 1/\lambda F$)

$\dfrac{\partial\tau(v_i)}{\partial v_i} = \lambda F \dfrac{\partial\tau(v)}{\partial v}$ has dimensions of m^{-1}

$\dfrac{\partial\tau(v)}{\partial v}$ is dimensionless